

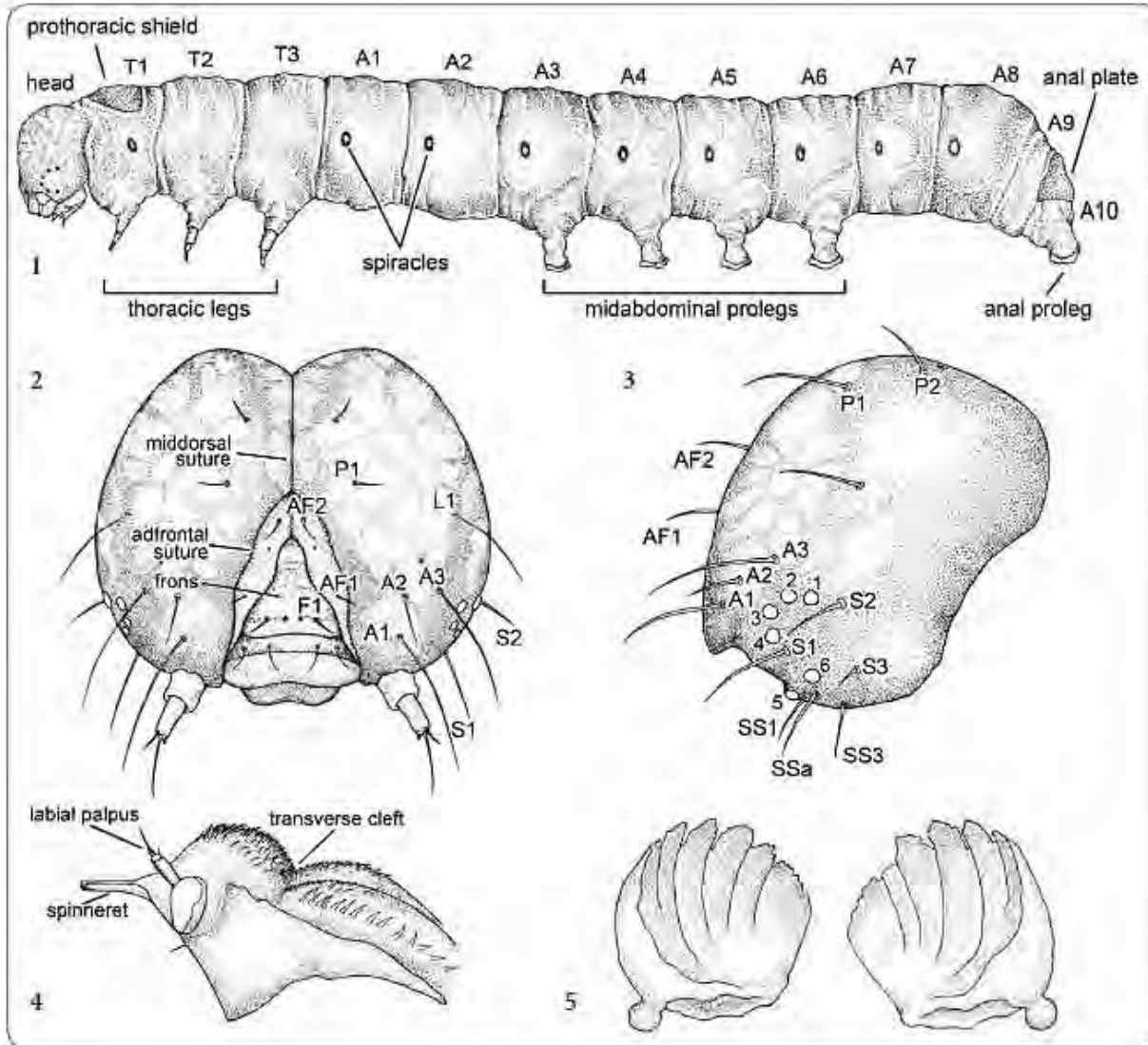
Caterpillar Morphology and Larval Taxonomy

David L. Wagner and Todd Gilligan



<http://twistedsifter.com/2011/08/electron-microscope-photography/>

Larval Lepidoptera



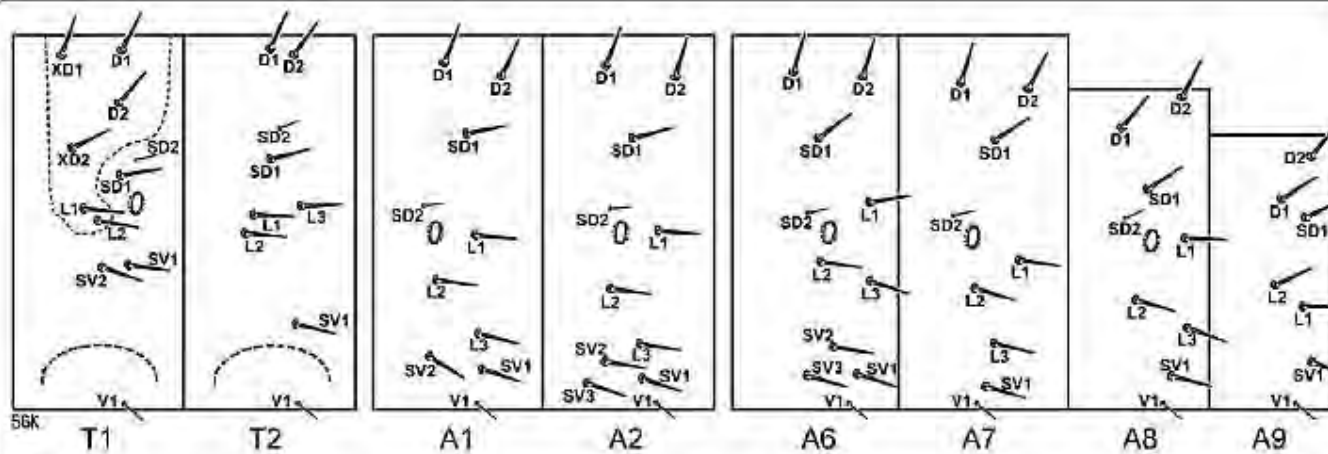
■ LARVAL MORPHOLOGY.

FIG. 1: LATERAL VIEW OF WHOLE BODY. FIG. 2: FRONTAL VIEW OF HEAD. FIG. 3: LATERAL VIEW OF HEAD.

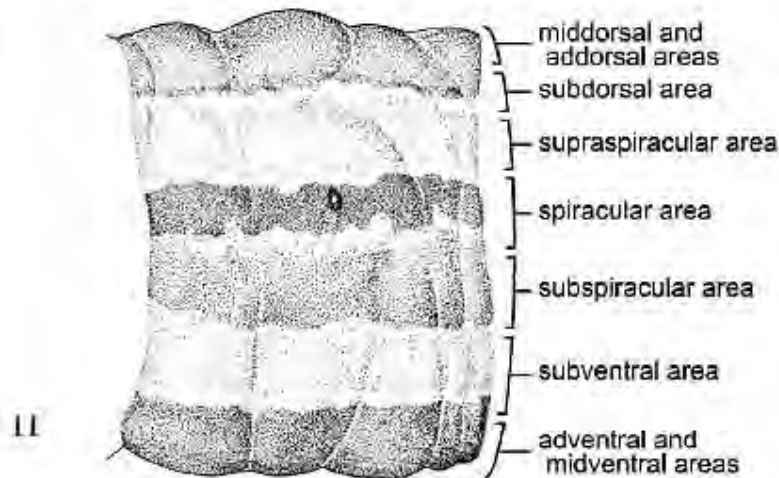
FIG. 4: HYPOPHARYNGEAL COMPLEX. FIG. 5: MESAL OR INNER SURFACES OF MANDIBLES. ■

- usually cylindrical
- six lateral ocelli
- labial spinneret
- spiracles on T1 and A1-A8.
- prolegs on A3-A6 and A10 (although anterior prolegs often lost) (for speed or distance walking)
- prolegs with crochets (hooks)
- prothoracic shield on T1
- anal plate or shield on A10

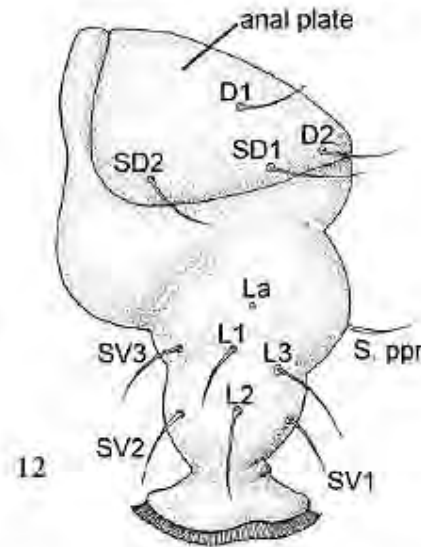
Larval Chaetotaxy and Other Features



10



11



12

* primary setae homologous across groups

* nomenclature for setal arrangement (chaetotaxy) standardized by Hinton (1946): often (2) dorsal, (2) subdorsal, (3) lateral, (1-3) subventral, and (1) ventral setae.

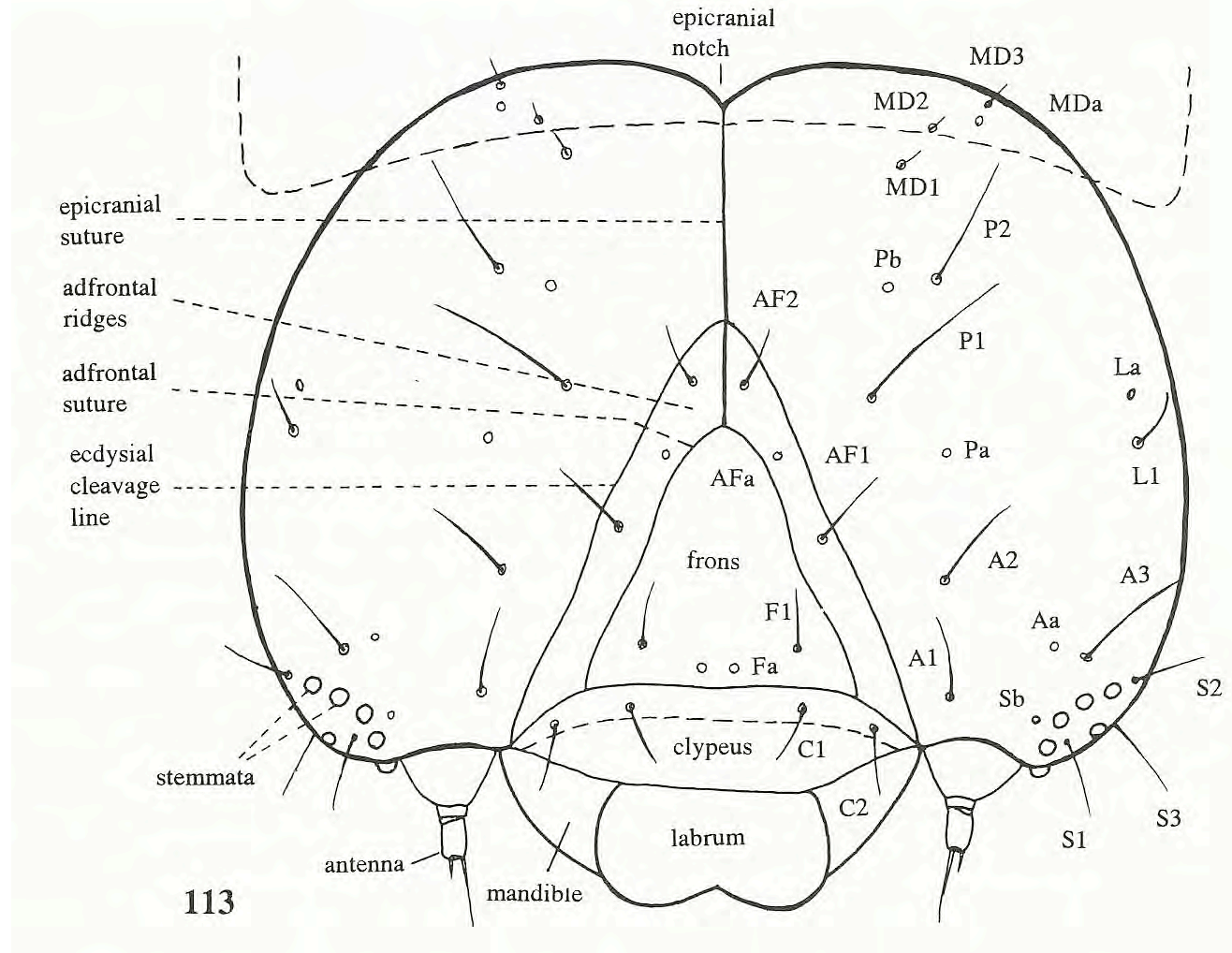
■ LARVAL CHAETOTAXY AND PATTERNING.

FIG. 10: SCHEMATIC DIAGRAM OF FIRST TWO THORACIC AND SIX ABDOMINAL SEGMENTS SHOWING NAMES FOR PRIMARY SETAE.

FIG. 11: TRUNK REGIONS. FIG. 12: LATERAL VIEW OF A10 WITH PRIMARY SETAE INDICATED. ■

Head

- Epicranial notch
- (Six) stemmata
- not ocelli
- Antennae
- Mandibles
- Spinneret
- Chaetotaxy



Head

- Epicranial notch
- (Six) stemmata
- not ocelli
- Antennae
- Mandibles
- Spinneret
- Chaetotaxy

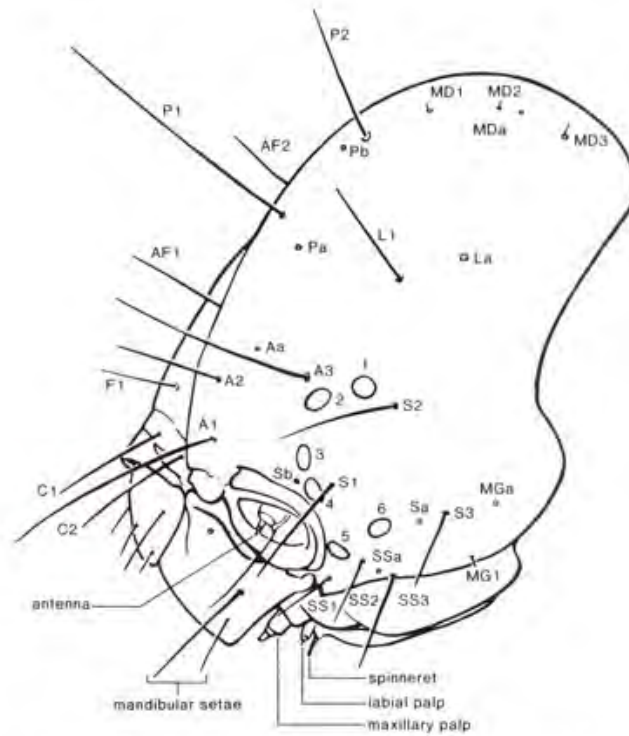
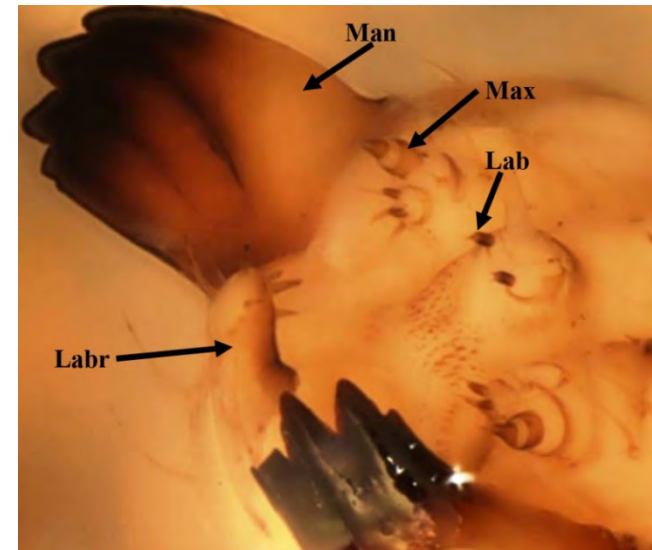


Figure 26.2. Head capsule, lateral view. See pages 299-301 and table 26.2.



D. W. McCoy, USDA/APHIS

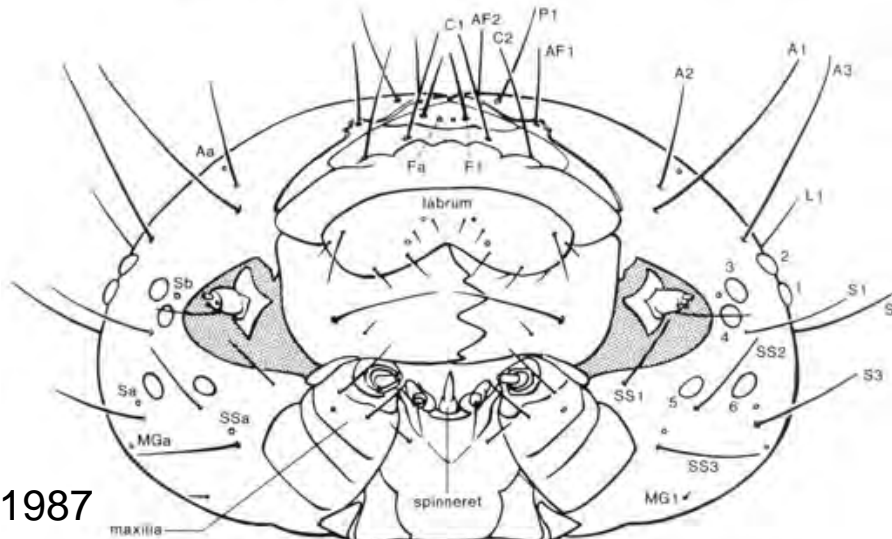
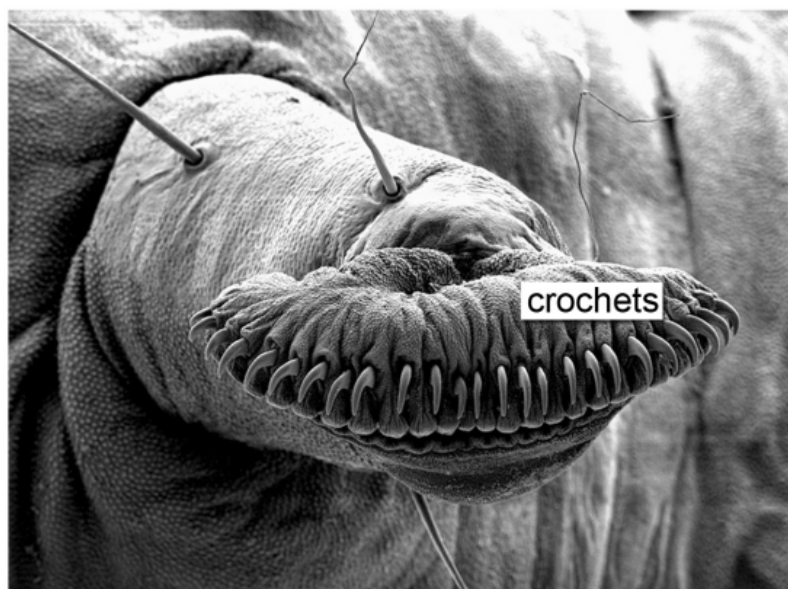
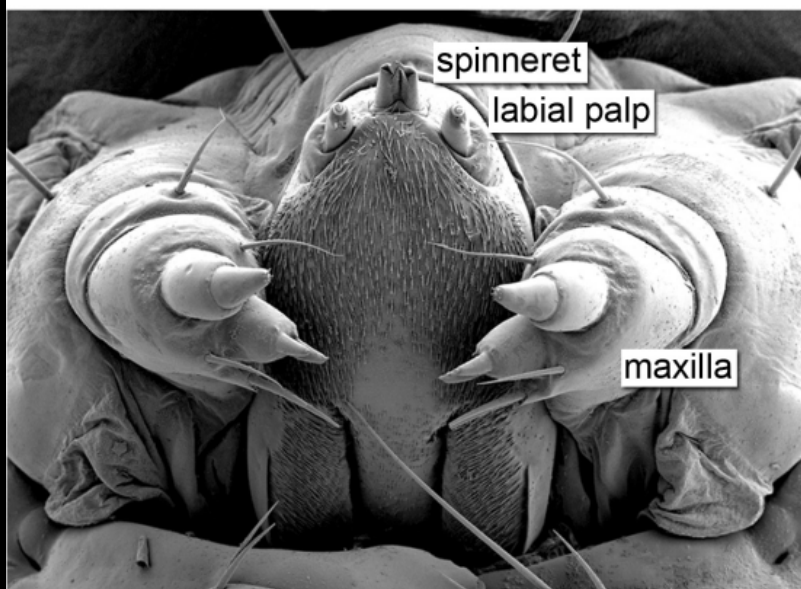
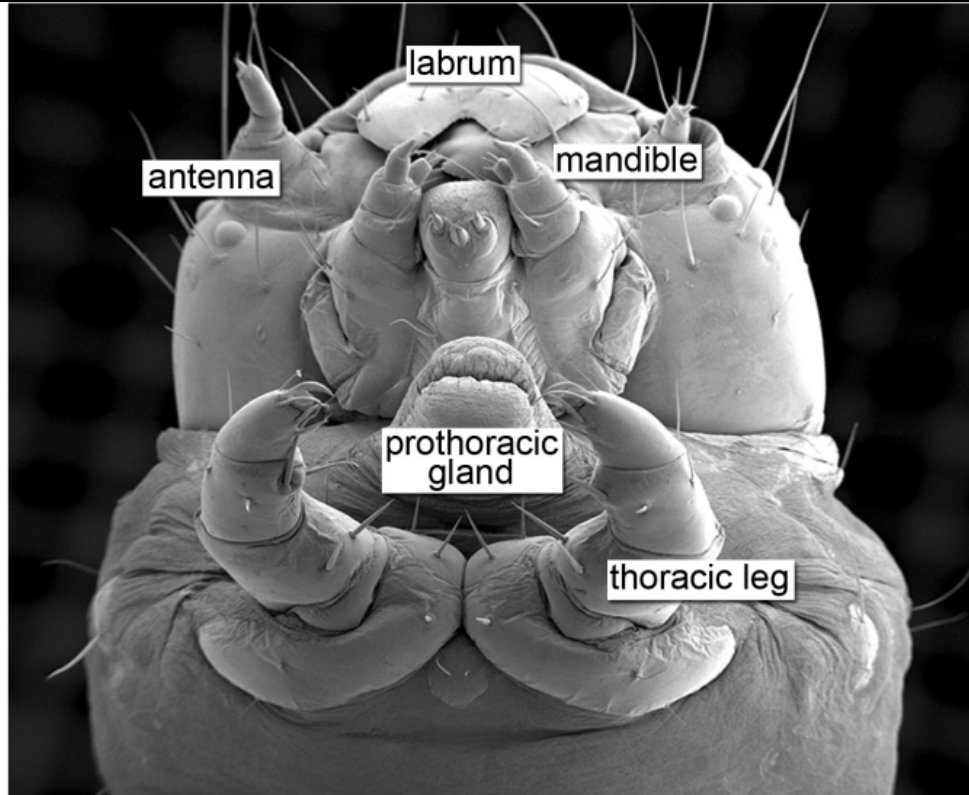
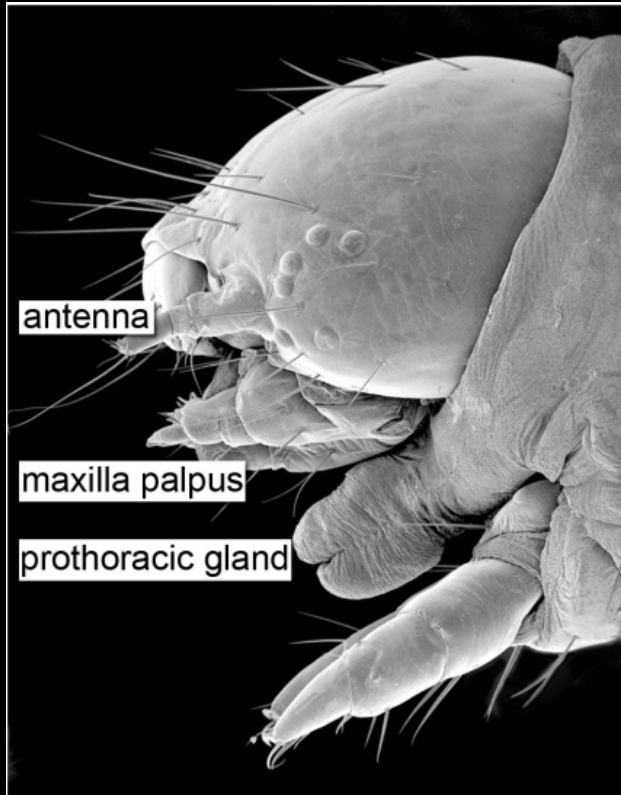
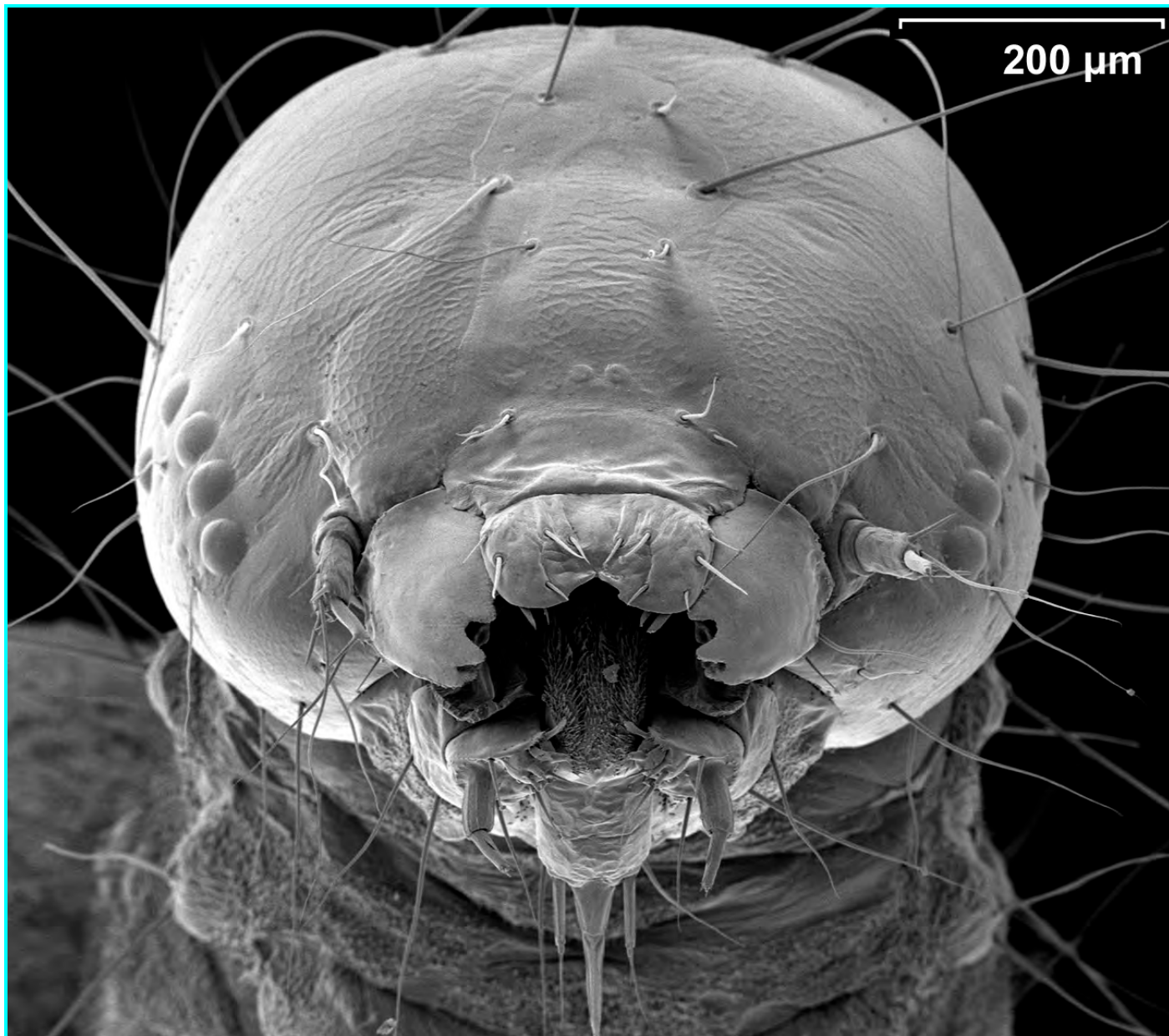


Figure 26.3. Head capsule, ventral mouth area. See pages 299-301 and table 26.2.

Stehr 1987







Thorax

- Prothoracic shield
- Thoracic legs
- Prothoracic spiracle
- Chaetotaxy

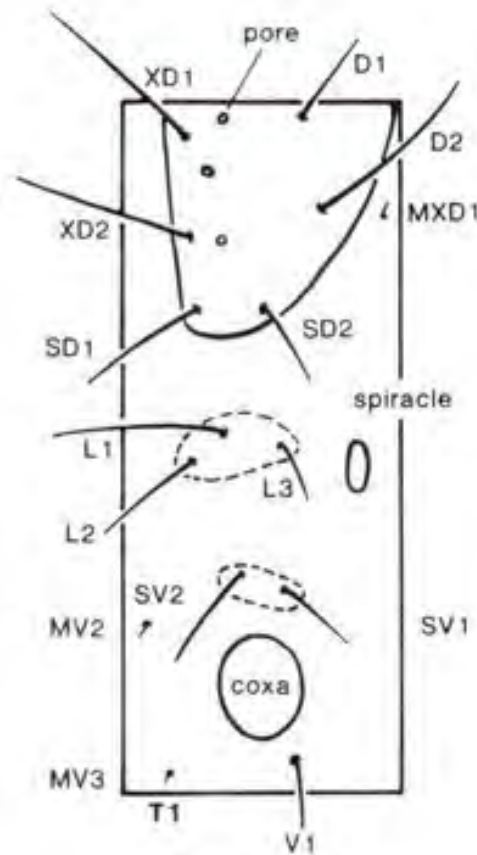


Figure 26.20

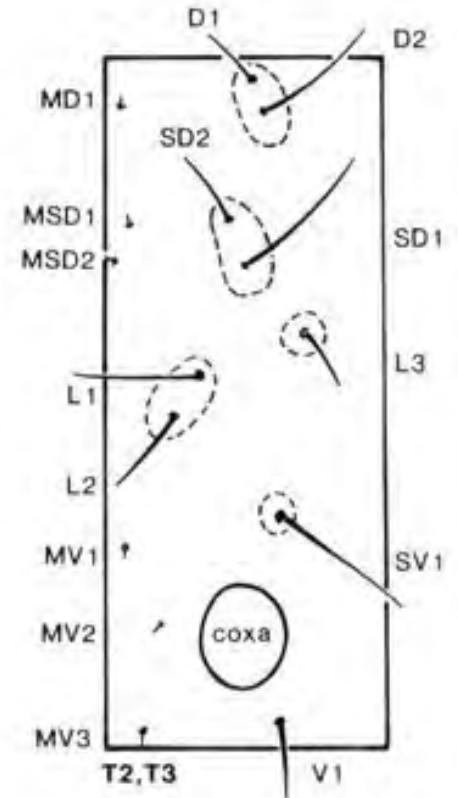


Figure 26.21

Stehr 1987

Thorax

- Prothoracic shield
- Thoracic legs
- Spiracle
- Primary and secondary setae
- Chaetotaxy

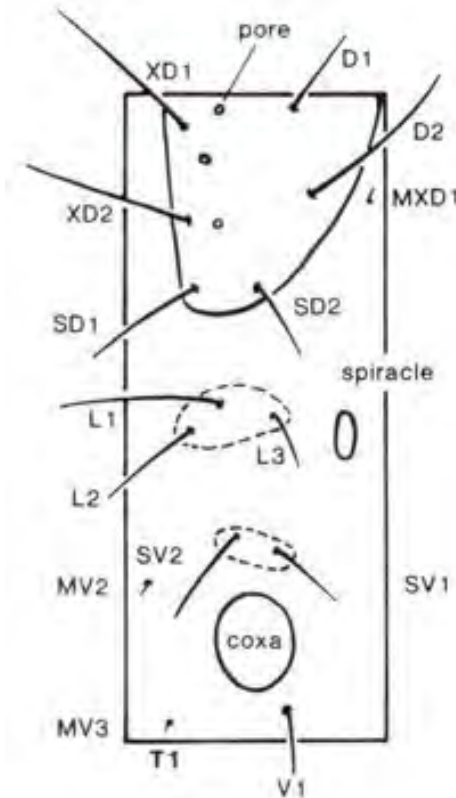


Figure 26.20

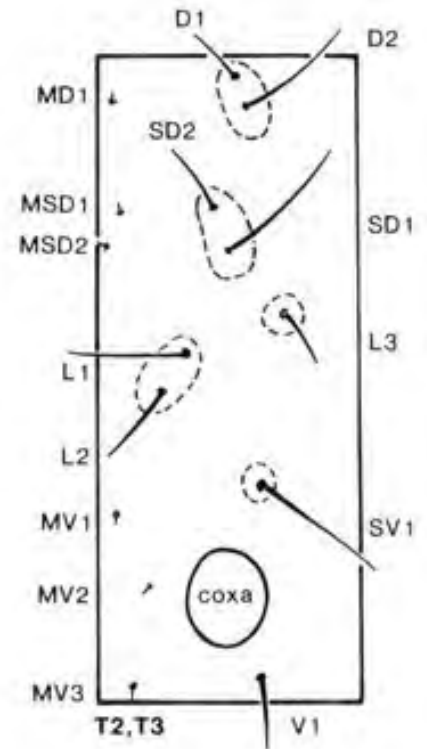
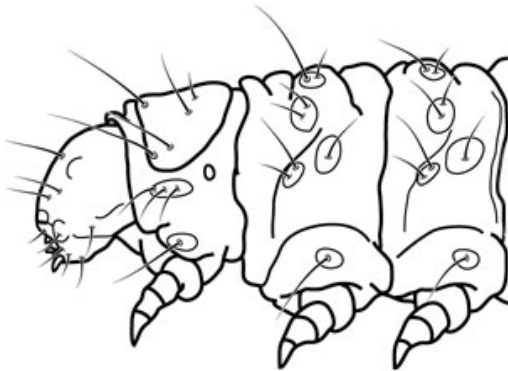


Figure 26.21



Abdomen

- Spiracles
- Abdominal prolegs
- Crochets
- Primary and secondary setae
- Anal shield
- Chaetotaxy

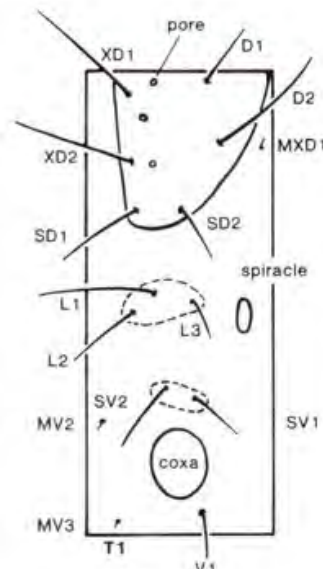


Figure 26.20

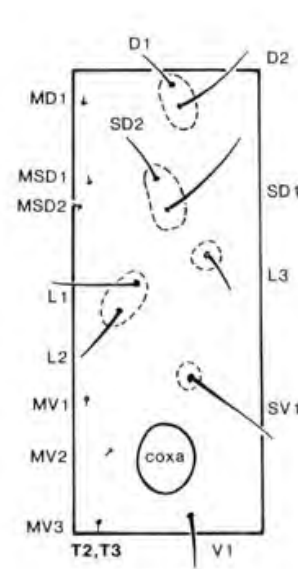


Figure 26.21

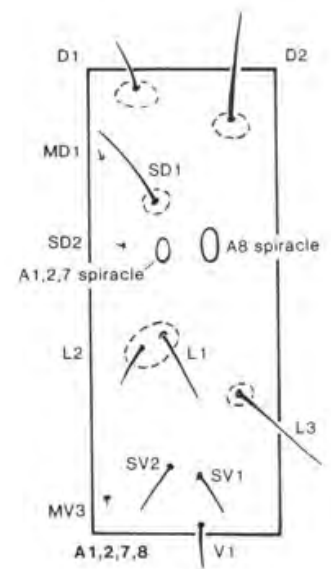


Figure 26.22

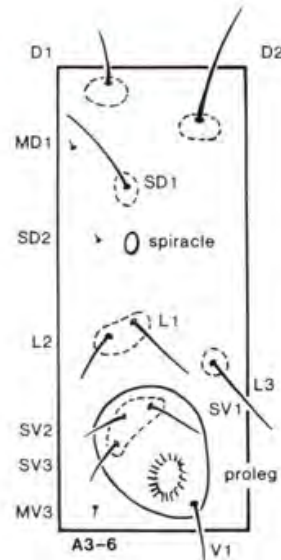


Figure 26.23

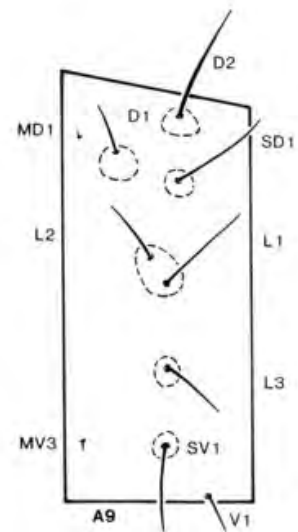


Figure 26.24

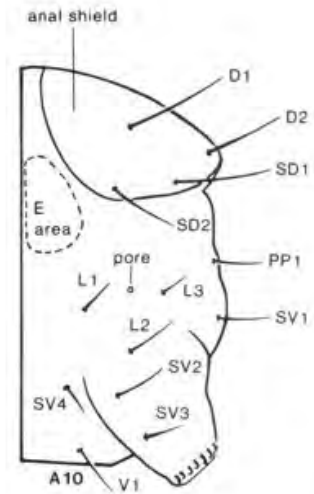


Figure 26.25

Abdomen

- Spiracles
- Abdominal prolegs
 - Segments A3-6, A10
 - many basal Noctuidae (e.g., Plusiinae) A5-6, A10
 - Geometridae A6, A10
- Crochets
- Primary and secondary setae
- Anal shield
- Chaetotaxy

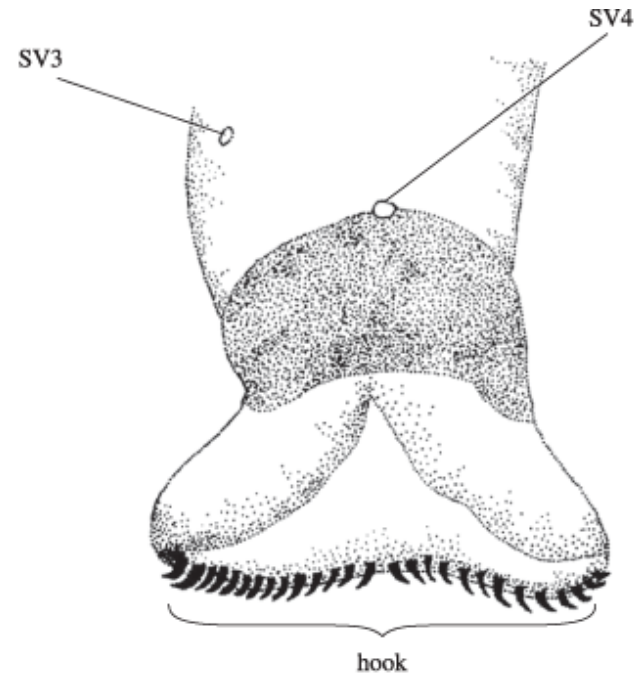


Figure 18. *Aucula magnifica* - Ventral view of a larvopod. SV3- SV4) subventral setae.

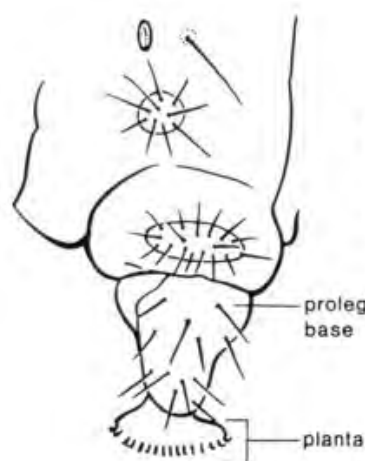


Figure 26.5

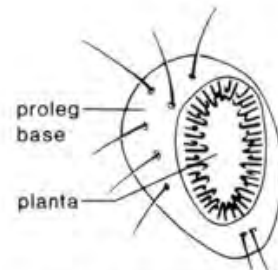


Figure 26.6, ventral view

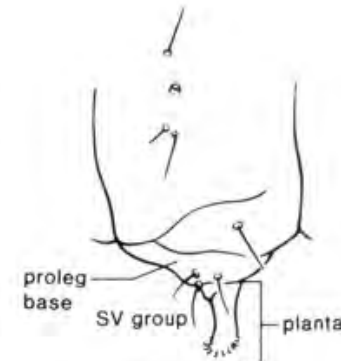


Figure 26.7

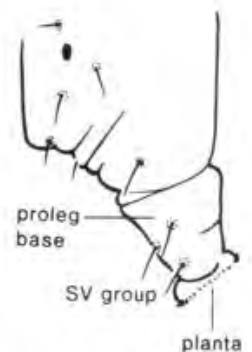
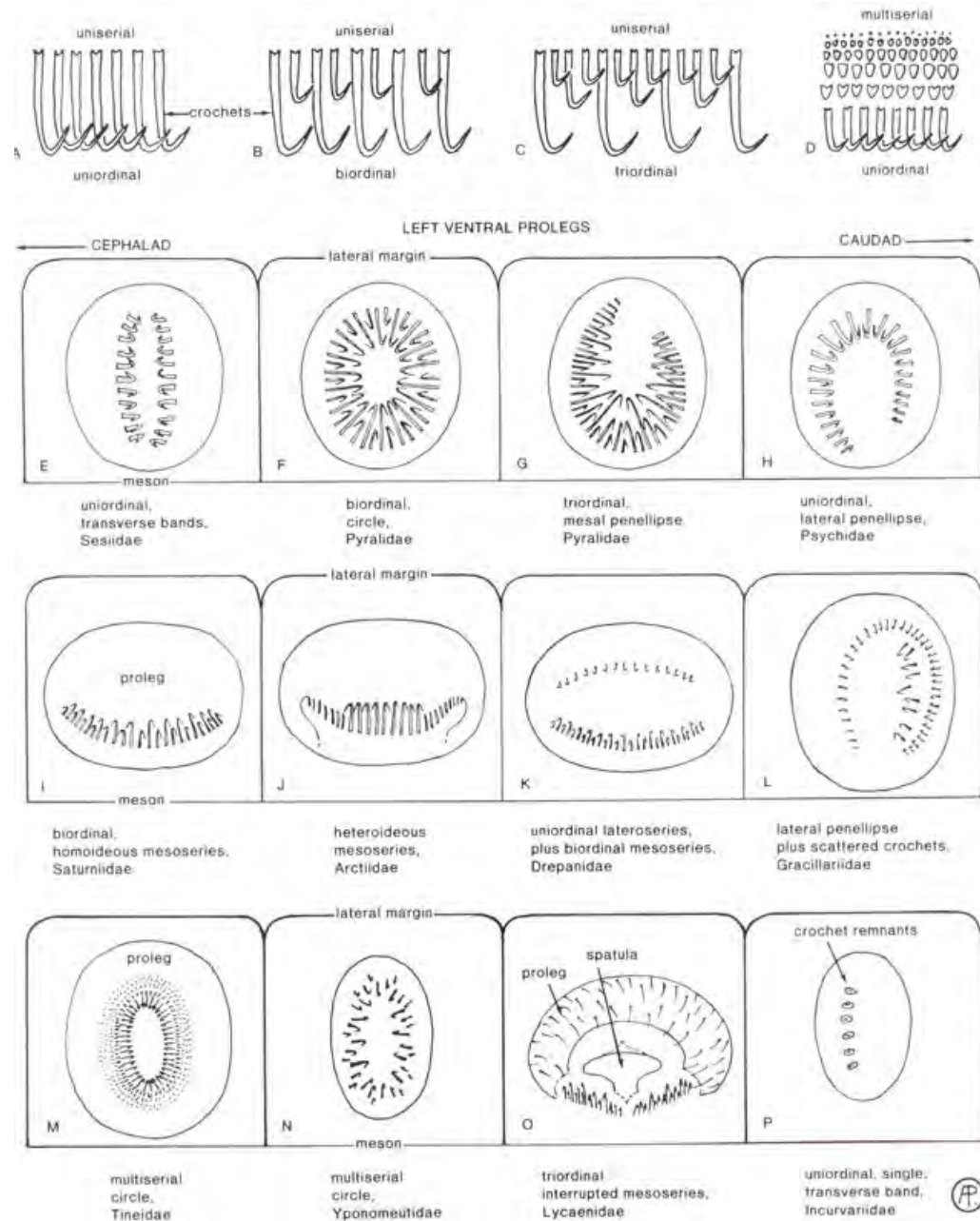


Figure 26.8

Abdomen

- Spiracles
- Abdominal prolegs
- Crochets
 - Arrangement
 - Circle
 - Ellipse
 - Mesoseries
 - Length
 - Uniordinal
 - Biordinal
 - Triordinal
- Primary and secondary setae
- Anal shield
- Chaetotaxy





130



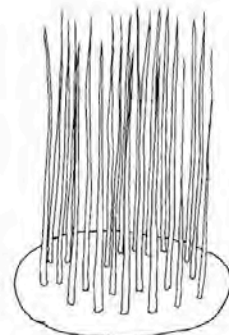
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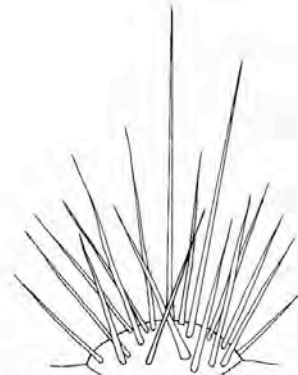
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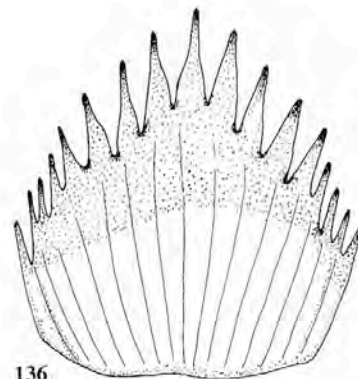
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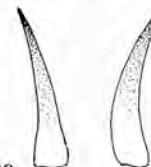
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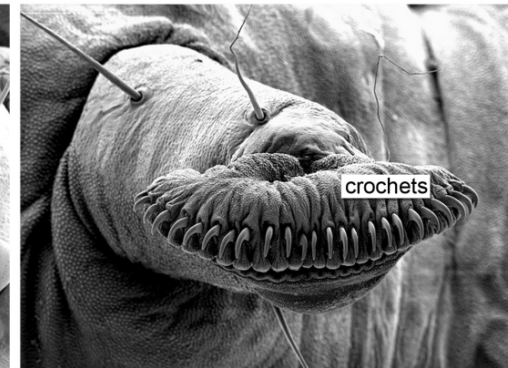
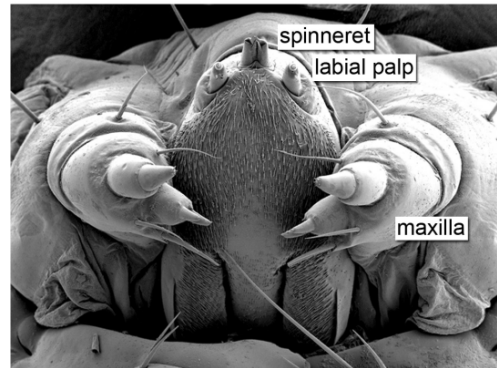
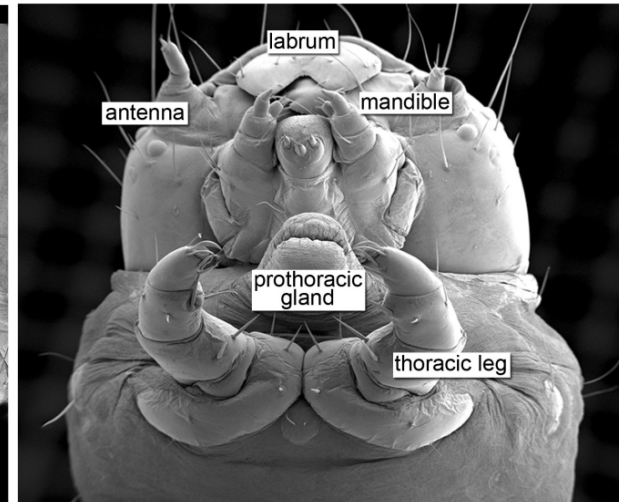
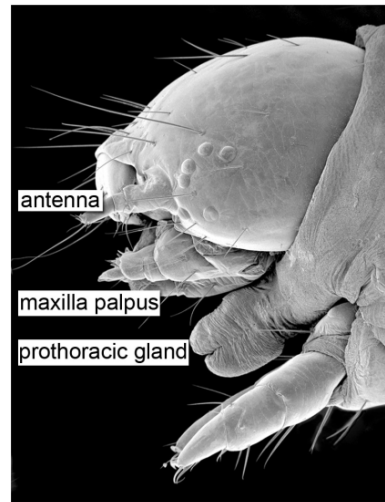
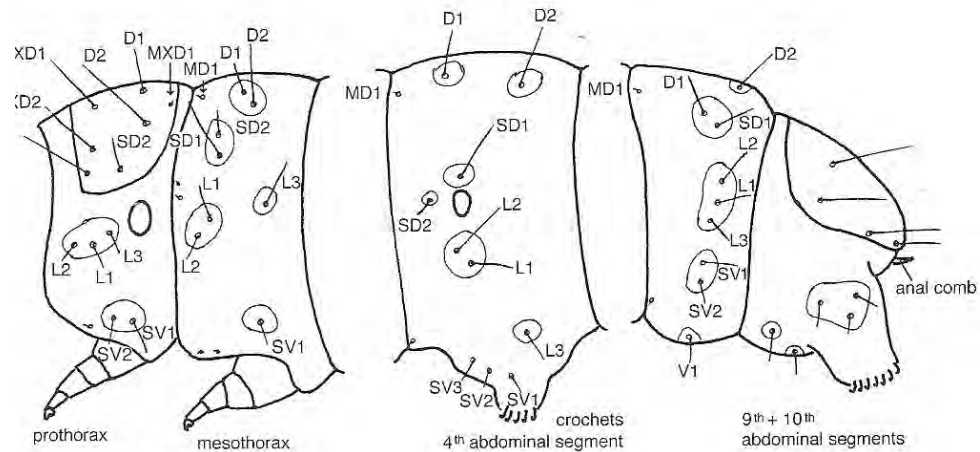
Figs 130-138. Larval morphology. 130-135, cuticular armature: 130, pinaculum with single seta; 131, chalaza; 132, 133, scoli; 134, verricle; 135, verruca; 136-138, anal plates. (130-135, after Peterson, 1962; 136-138, after Gerasimov, 1952.)

Primary vs. Secondary Setae

- **primary setae:** those setae represented in the ground plan or ancestral lineage(s) of Lepidoptera; primary setae are broadly homologous across lepidopteran families. Primary setae have a standardized nomenclature. Number and positions of primary setae are used in the identification and classification of Lepidoptera.
- **secondary setae:** setae in excess of primary setae, i.e., those represented in the ground plan or ancestral lineage(s) of Lepidoptera; in many taxa those setae added in the second to final instars.

Family-level Taxonomy

- * body proportions
- * chaetotaxy on body and head
 - presence of 2ndary setae
 - size and length of setae
 - branched or unbranched
 - etc.,
- * crochets: arrangement and size heterogeneity
- * proleg number
- * glands
- * thoracic and anal plates



Species-level Taxonomy

- * color patterns helpful for most external feeders (but much less so for internal feeders)
- * chaetotaxy on body and head
- * hypopharyngeal complex
- * mandibular teeth
- * spiracular size
- * crochet arrangement and number

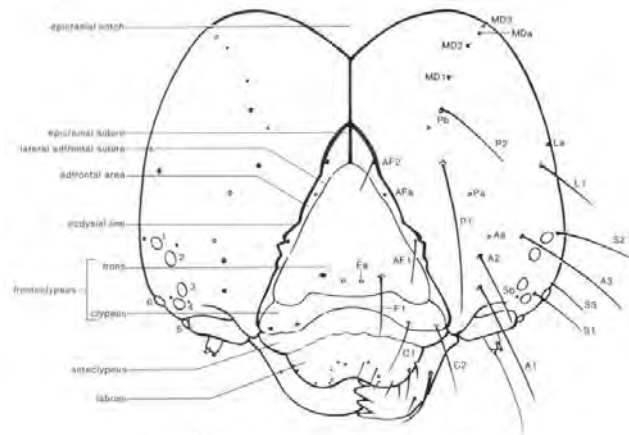
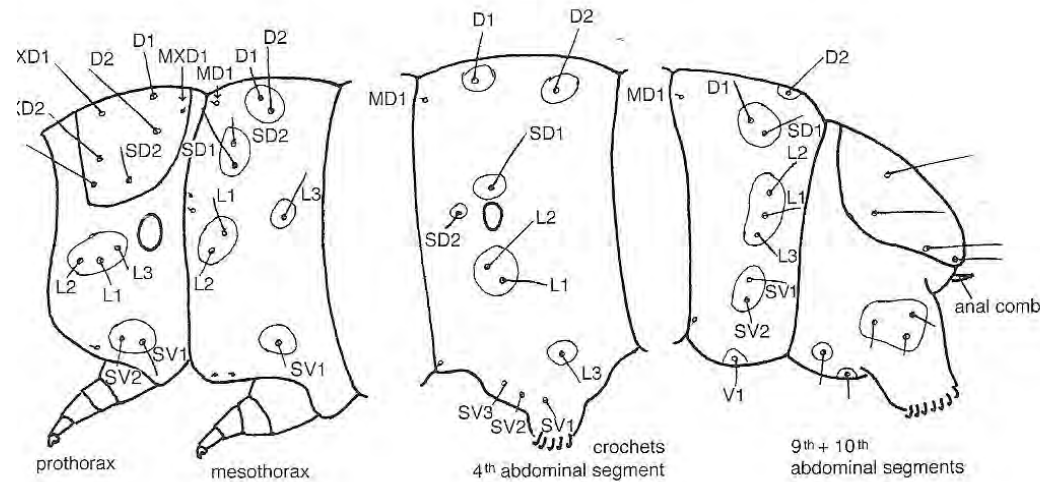
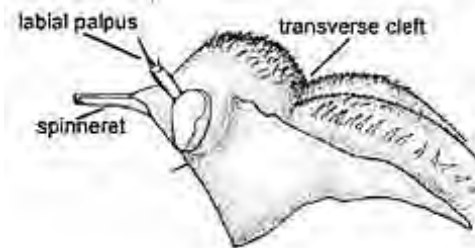


Figure 26.1. Head capsule, frontal view. See pages 299-301 and table 26.2.



Accelerated Larval (Phenotypic) Evolution



Elasmia packardii
(Central Texas)

Elasmia larvae differ in

- * head coloration
- * development of mid-dorsal process on A8
- * relative contributions of both yellow and black pattern elements



Elasmia cave



Elasmia wagneri



Elasmia packardii
JDG_1279



Elasmia cave PARATYPE
JDG_1282



Elasmia mandala
holotype JDG_1733



Humped Prominent (*Oligocentria delicata*)

RECOGNITION Brown and lime green with enormous hump over A1 and smaller triangular hump over A8. A7 with cluster of white lateral spots. Head with creamy spot to either side of triangle. To 3 cm.

OCCURRENCE Woodlands, creeks, and canyons of southeastern Arizona. Principal generation during monsoon in late August and September, but possibly partial generations during periods of favorable growing conditions.

COMMON FOODPLANTS Walnut.

REMARKS The larva is cryptic: most walnut leaves have necrotic brown spots by August when the larvae are maturing. Like other members of its genus, the larvae carves out a cavity as it feeds and then positions its body along the length of the feeding cavity and becomes the surrogate leaf edge. Its outline is so unique it is easy to imagine that many people (and natural enemies) simply overlook the animal because it is so far outside what one expects to see, even when hunting for caterpillars. The individual shown here, found by Sam Jaffe in the Chiricahuas, pupated about the first of September and emerged about two weeks later. The adult has been confused with that of the more common *Xylinodes pallida* in collections.

Taxonomic Conundrum



Oligocentria "pallida"

Host: Arizona sycamore (*Platanus wrightii*)

One species?



Or two?

Selected references

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